



Technical updates from the Forest Health Program of the Missouri Department of Conservation

Forest Entomologist's Notes

This has been a very busy spring and summer for forest insect issues. The most fascinating insect event, that grabbed the attention of a large portion of Missourians, was the huge cicada emergence.

Periodical Cicadas

The population of periodical cicadas that emerged in 2011 is Brood XIX of 13-year cicadas that extends from Missouri to North Carolina. It's the largest of four broods found in Missouri. This year's emergence did not disappoint. Cicadas came out in huge numbers in many places across the state. Emergence was a more prolonged event than the last time this brood appeared in 1998. Cool



Periodical cicada and oviposition slits
on redbud branch

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weather in the first and third weeks of May slowed emergence, which is dependent on warm soil temperatures. Emergence began at the southern edge of Missouri in the second week of May, progressed northward across the state, slowing during the third week, and finally occurred at the northern edge of the state by the end of the month. Cicada adult numbers were high through the first half of June, and then tapered off until most adults were gone by the end of June.

The distribution of emerging cicadas in 2011 closely matched historical maps of emergence in past years. Significant numbers of cicadas were reported across most of the state, except for the Bootheel, the northwest portion and extreme western edge of the state. However, there were a few scattered and

unexpected reports of periodical cicadas from Kansas City, northwestern Missouri, southwestern Iowa, and eastern Kansas. These latter cases may be examples of “stragglers” from Brood IV, a brood of 17-year cicadas that extends from Iowa across western Missouri and eastern Kansas and south into Oklahoma. The next large emergence of Brood IV will be in 2015. But occasionally some members of a brood will emerge one to four years earlier or later than most brood members.

The next periodical cicada brood to emerge in Missouri will be Brood III (17-year cicadas), emerging in 2014 along the state’s northern border. Two more broods will emerge in 2015 on opposite sides of the state: Brood IV (17-year cicadas) in western Missouri and Brood XXIII (13-year cicadas) in southeast Missouri. These two broods do not overlap. More details on periodical cicadas here:

<http://magicicada.org/>

<http://mdc.mo.gov/landwater-care/forest-management/forest-health/periodical-cicadas>

Branch Flagging: Cicadas and Other Causes

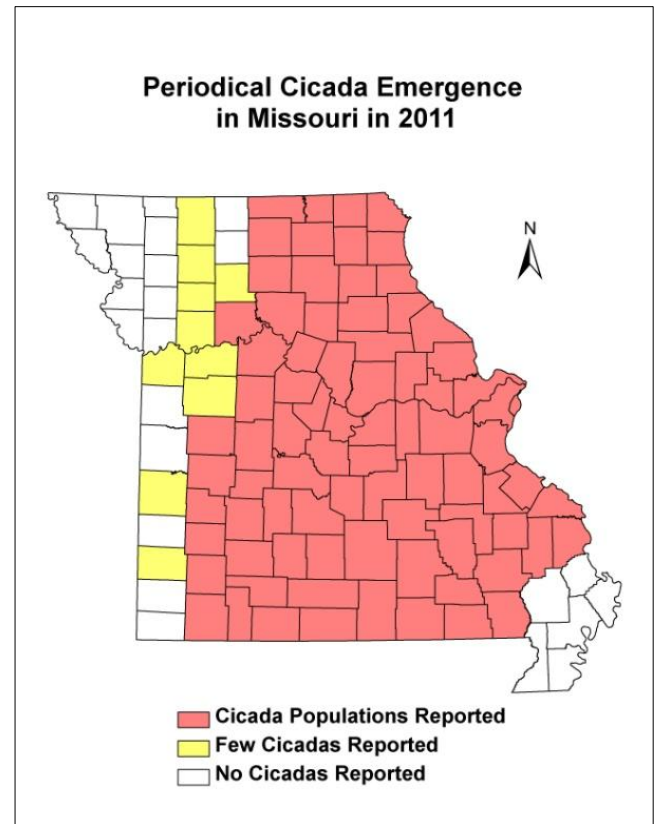
Brown leaves appearing on individual branches scattered throughout the tree crown, or branch flagging, can be caused by many kinds of insects and diseases. Flagging is common now on many types of trees and shrubs due to **cicada oviposition** (egg deposition). Female cicadas use a saw-like appendage on the abdomen (ovipositor) to slice into the underside of 1/8- to 1/2-inch diameter twigs and deposit their eggs. The weakened twigs are often broken by wind and dangle from a branch or fall to the ground. On more vigorous branches, cicada-caused wounds will heal, and branches continue growing.



Branch flagging caused by cicada oviposition

For trees with many cicada-damaged branches, the primary recommendation is to avoid further stress on the tree. Provide supplemental water during drought and avoid further injury due to lawn equipment or other causes. If needed, do only very light pruning in summer to remove dangling twigs on small trees. Wait until trees are dormant in winter to do corrective pruning of branch structure.

Among other common causes of branch flagging, damage caused by **Kermes scales** (see below) and **Botryosphaeria canker** are two that are likely to be mistaken for cicada damage on oaks. In late summer and fall, flagging and dropping of branches on oaks, hickories and other hardwoods may be



caused by **twig girdlers** or **twig pruners** (longhorned beetles). For more details and images, see these sites: <http://mdc.mo.gov/landwater-care/forest-management/forest-health/tree-branch-flagging>
[Kansas Insect Newsletter, August 7, 2009](#)

Kermes Scales: Another Cause of Branch Flagging

This summer, and also in 2010, we received many reports throughout southwestern Missouri of branch flagging on post oaks due to Kermes scales (probably *Nanokermes pubescens*). We also received a few reports this year from St. Louis. Feeding damage by these sucking insects often causes large numbers of leaves and small twigs to drop to the ground. Another species (probably *Allokermes galliformis*) caused significant damage in 2009 to pin oaks and others in the red oak group. Kermes scales are not your typical looking insects. They are tan to reddish brown spheres ranging in size up to 1/4-inch diameter and are attached to twigs. They're often confused for an insect gall or bud. On post oaks, Kermes scales are usually found at the base of leaf petioles near tips of twigs.

Few studies have been done on the life histories of Kermes scales. But a general Kermes life history can be used as a guide for understanding the species in Missouri. There are two time periods during the year when crawlers are moving on the tree. Mature females, located on twigs, deposit eggs in June and possibly early July. The eggs hatch about a week after being deposited. Young scale crawlers then disperse to the trunk, large limbs, or remain on small branches. They feed and overwinter in those locations. In spring, at about the



Kermes scales on post oak (left; brown, striped spheres)
and on red oak (right; tan spheres)

time of budbreak on host trees, the crawlers molt to second instars, and the female crawlers migrate out to young twigs or newly expanding shoots. The females feed and grow rapidly into a spherical, gall-like shape during April and May.

In cases where Kermes scales are causing only minor leaf drop or the death of small twigs, the effect on tree health is minimal. A person can choose to take no action and allow natural controls of scales (predators and parasites) to build up. However, where chronic, significant damage occurs, the use of insecticides may be appropriate. Systemic insecticides (e.g., imidacloprid) registered for use on soft scales can be applied in the fall to control female crawlers migrating to new feeding sites in the spring.

Return of the Itch Mites?

During 2004 to 2006 many people in the Midwest experienced the annoying bites of the oak leaf itch mite (*Pyemotes herfsi*), after these tiny creatures dropped from trees where they had been preying on leaf gall insects and other insects in sheltered locations on trees. Itch mites were often associated with marginal fold galls on pin oak leaves. During the last four years, however, we have received very few reports of itch mites. Although the cause of the decrease is unknown, we can consider the possible role of the severe April 2007 freeze event that killed tree foliage and branch tips across the state. That damage in turn likely resulted in mortality of many insects that feed on those tissues and serve as prey for itch mites. Sub-freezing temperatures may also have directly caused some mite and insect mortality.

We could see an increase in itch mite activity again in the wake of the periodical cicada emergence this year. A large increase in itch mite complaints occurred in 2007 in northern Illinois following the emergence of a 17-year cicada brood that year. The reported cases started in early August. But it appeared itch mites were often coming from areas with very few oaks. It was eventually determined that itch mites had been feeding on cicada eggs in branches and were likely present on a variety of tree species. Northern Illinois did not have the severe freeze impacts that existed in Missouri in April 2007, so perhaps itch mite populations were at sufficient levels to take advantage of the food boom provided by cicada eggs. We cannot predict whether current itch mite populations in Missouri will respond in sufficient numbers to create a biting problem this year. But if not this year, perhaps the glut of cicada eggs will allow itch mite populations to start to rebound to annoying levels in the near future.

There is no effective control that can be applied to trees to reduce itch mite populations. The main remedies for mite bites are to reduce time spent under potentially infested trees, and launder clothes and shower immediately after returning indoors. The use of DEET repellent has shown mixed results in preventing bites.

<http://ento.psu.edu/extension/factsheets/leaf-gall-itch-mite>

<http://www.ksre.ksu.edu/library/entml2/mf2806.pdf>

Walnut Caterpillar and Yellownecked Caterpillar

Many types of defoliators have been out in large numbers this year. Walnut caterpillars have been reported in many locations, but most commonly across southwestern Missouri. The caterpillars feed on the leaves of black walnut, pecan, butternut, hickories, and occasionally a few other species. They are hairy and are a reddish color when younger and black when older. They move together in groups as they feed. Like all insects, walnut caterpillars must periodically molt (shed their



Clustering of walnut caterpillars during molting (Photo: Scott Roy)

exoskeletons) as they grow. When it's time to molt, walnut caterpillars cluster in a mass on tree trunks or lower limbs. They leave behind a woolly mass of exoskeletons, when they return to the leaves to feed.

Walnut caterpillars have two generations per year. Heavy defoliation by mature caterpillars of the first generation was reported frequently in July. Young larvae of the second generation are now hatching and will be feeding during August and September. No insecticide treatments are recommended at this late stage of the summer. However, when groups of caterpillars descend onto the trunk to molt, that provides an opportunity to control them by merely scraping the entire mass of caterpillars off into a bucket of soapy water to kill them.

<http://entopl.okstate.edu/ddd/insects/walnutdatana.htm>

<http://bugs.osu.edu/~bugdoc/Shetlar/factsheet/ornamental/FSwalnutcat.htm>

Yellownecked caterpillars, another member of the *Datana* genus along with walnut caterpillars, have been active recently. Yellownecked caterpillars also feed colonially in groups. They look similar to walnut caterpillars, except they have a yellow "neck" or pronotum behind the head, while walnut caterpillars have a black pronotum. Yellownecked caterpillars feed on leaves of oaks, hickories, maples, fruit trees and many other hardwood tree species.

<http://www.hfrr.ksu.edu/DesktopModules/ViewDocument.aspx?DocumentID=1746>

Japanese Beetle

Japanese beetles are widespread across Missouri, although their distribution is patchy. This year we've received several calls from people around the state who are seeing Japanese beetle adults for the first time and wondering what they are. Apparently populations are expanding in new areas. There are several approaches to management of Japanese beetles; see the following references for details. Remember – it is not a good idea to use Japanese beetle traps, unless they can be placed at least 100 ft. from plants to be protected. Traps are very effective at attracting beetles, but not catching all of them. Plants near traps can be heavily damaged.

<http://www.ca.uky.edu/entomology/entfacts/ef451.asp>

<http://www.mobot.org/gardeninghelp/plantfinder/IPM.asp?code=67>

Shingle Oak Skeletonizers

A complex of moth caterpillar species that feed by skeletonizing shingle oak leaves periodically erupt at outbreak levels in parts of Missouri. They feed by removing tissue from the lower surface of leaves, and leaving clumps of brown fuzz (leaf hairs) on the leaf surface. Entire tree crowns can become brown. In 2010 outbreaks were seen in western and southern Missouri. This year, the first reports of heavier leaf damage have come from southeastern Missouri, primarily in a swath



Skeletonized shingle oak leaves

extending roughly from Sullivan south to Piedmont and Doniphan. Some damage has also been observed again in parts of western Missouri. No insecticide treatments are recommended, because most trees tolerate this damage that occurs in mid- to late summer, and outbreaks typically subside on their own after one to two years.

Emerald Ash Borer

The emerald ash borer (EAB) infestation in Wayne County is the only known infestation in Missouri, as of July 2011. The annual trapping survey to detect the presence of EABs is underway again this year. The U.S. Department of Agriculture set out more than 800 large purple sticky traps this spring in Wayne County surrounding the known infestation to delimit and monitor its spread. The Missouri Department of Agriculture placed over 400 traps at high-risk sites around the state to detect other possible infestations. Traps are currently being collected and will be examined over the next several weeks. Final results of this year's survey will be available in early fall.

For more information about the emerald ash borer in Missouri, see the Missouri EAB web site and recent issues of the *Borer Bite* newsletter: <http://eab.missouri.edu> An article in the March 2011 *Borer Bite* discusses how communities and homeowners should prepare now for the arrival of EAB in their area ("Managing Missouri's Ash Trees for EAB: Treat, Cut, or Leave Alone & Wait?") http://extension.missouri.edu/emeraldashborer/pdf/EABNews_March2011.pdf

The National Park Service is considering a strategy for addressing the impact of EAB on the more than 900 ash trees at the St. Louis Gateway Arch (Jefferson National Expansion Memorial). Part of the strategy includes replacing the ash trees with another single species along the major walkways. This differs from other EAB management strategies in which the goal is to increase tree species diversity when replacing trees. The proposed strategy would retain a single species along walkways, because as stated by the Park Service: "The primary goal of the tree replacement is to maintain the significant character-defining qualities of the planting as they contribute to the Memorial's status as a National Historic Landmark." The Park Service is seeking public input on the EAB Strategy Environmental Assessment until August 24, 2011. For more details, see: <http://parkplanning.nps.gov/projectHome.cfm?projectID=29875>

Gypsy Moth

The annual gypsy moth detection survey is also underway in Missouri. Almost 6,000 traps are being monitored by multiple state and federal agencies. The survey covers half the state including all of northeastern Missouri, St. Louis, Kansas City, Columbia, Springfield, major lake and recreation areas, and other high-risk sites and counties. No established populations have yet been found in Missouri. However, there is growing concern about increases in gypsy moth populations to our north. A large increase in gypsy moth trap catches occurred in 2010 in northeastern Iowa as far south as Jackson County south of Dubuque. Aerial treatments using mating disruption techniques were scheduled to be applied in June 2011 to 158,000 acres in three Iowa counties.

<http://mda.mo.gov/plants/pests/gypsymoth.php>
<http://www.extension.iastate.edu/pme/GypsyMoth.html>

Asian Longhorned Beetle

In June 2011, Ohio became the fifth state where an Asian longhorned beetle (ALB) population has been detected. ALB is a serious, exotic wood boring pest of maples, elm, birch, willows and other hardwoods. The infestation was detected in Bethel, Ohio about 30 miles southeast of Cincinnati, when a homeowner reported unusual damage in three maple trees to an Ohio Department of Natural Resources forester.

<http://www.agri.ohio.gov/TopNews/asianbeetle/>
<http://www.beetlebusters.info/>

Forest Pathologist's Notes

Thousand Cankers Disease Found in New Locations

Thousand cankers disease (TCD) has not been detected in Missouri but represents a serious threat to our black walnut resource. A couple weeks ago, TCD was reported in Virginia. This is the second state in the eastern range of black walnut with TCD detections, and also means TCD has been detected in states on both coasts. In addition to Virginia and Tennessee, 9 western states (WA, OR, ID, CA, NV, UT, AZ, CO, and NM) have had TCD detections.



TCD infected walnut trees in Tennessee (Photo: Diane Warwick, TN Div. of Forestry)

Insects and Mites to Watch for in August

- **Spider mite** populations build up as tree and shrub pests when hot, dry weather persists.
- Second generation **walnut caterpillars** feed in colonies on walnut, pecan, hickory and other hardwoods.
- Webbed colonies of **fall webworms** appear on several hardwoods, especially walnut and persimmon.
- These and other defoliators causing defoliation only in late summer are of minor concern for most trees, because impact on tree health is minimal at this late stage of the growing season.
- **Itch mites** sometimes become a biting nuisance on humans in late summer or fall as they drop from trees when their insect prey (leaf gall insects, cicada eggs and others) are no longer available.
- A variety of **stinging caterpillars**, capable of causing skin irritation or painful rash, appear in late summer. Many feed on hardwood tree foliage, but do not cause significant damage.

A Missouri state quarantine has been imposed to keep TCD out of Missouri. All untreated walnut logs, walnut wood, hardwood firewood, walnut nursery stock and walnut scionwood are banned from all states where TCD has been detected.

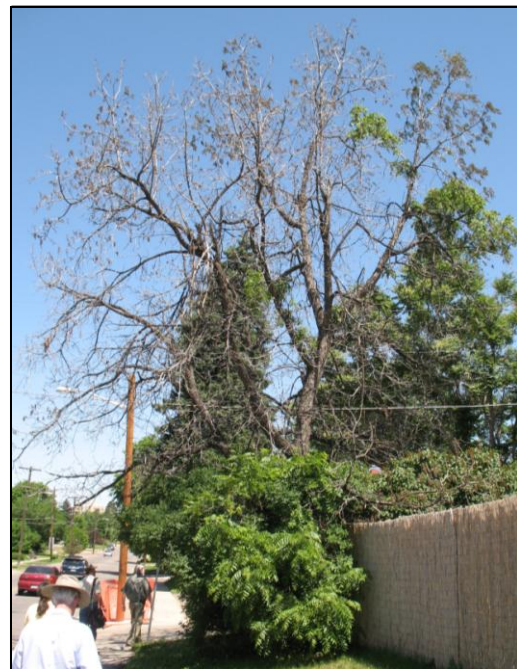
MDC and Missouri Department of Agriculture (MDA) staff and trained volunteers are conducting visual surveys for TCD at high-risk sites across the state this summer. MDA is surveying sawmill sites and urban areas and MDC is surveying campgrounds, high-risk natural forested areas and plantations. Agency staff are also following up on reports of declining walnut from the public. Detection of TCD is based on

observation of pockets of walnut trees displaying external symptoms and examination of branches from suspect trees for walnut twig beetles and cankers.

TCD only affects walnut species. Symptoms include midsummer yellowing and wilting of leaves on limbs high in the crown, leading to limb dieback, usually from the top down. As the disease progresses and limbs are killed, new sprouts may grow from the roots or trunk prior to tree death. Removing bark from dying limbs 1-2 inches in diameter exposes dark brown cankers around beetle tunnels. Photos, additional information, and links to other TCD sites can be found at www.mdc.mo.gov/thousand-cankers.

You can help evaluate walnut trees for TCD symptoms in your community.

- Review the information at the website.
- Fill out the online reporting form at the website for any trees displaying possible symptoms.
- Photos of suspicious trees or branches, including the entire tree, a close-up of leaves and any other visual symptoms can be emailed to forest.health@mdc.mo.gov along with contact information.
- Or, report suspect trees to local Missouri Department of Conservation foresters.
- Do not send samples from suspect trees for examination and testing by plant diagnostic labs without prior training. Sufficient samples for testing are challenging to collect and procedures must be followed to ensure that TCD is not further spread in transport to the testing lab.
- Any time walnut trees are harvested or removed, evaluate the branches when they are on the ground. Report examination of these trees using the online reporting form even when TCD symptoms were not found.



Symptoms of TCD include wilted brown leaves and epicormic sprouts from the trunk or base of the tree



Symptoms of TCD include cankers and beetle tunnels under the bark of 1-2 inch diameter branches

Conifer Problems Continue

Reports of pine and spruce that have declined or died over the winter, spring, or summer continue. As reported in the last newsletter, environmental stress probably plays a large role.

Some reports have specifically involved the new shoots and needles of spruce and white pine. New shoots on these trees are very tender, and are sensitive to cold temperatures and hot, drying winds, both of which occurred last spring. In other cases, herbicide applications near the trees may be responsible for damage. Imprelis is a new broadleaf herbicide that has been linked to damage in some situations. Injury seems to be

consistent with that of other herbicides in the synthetic auxin family (2,4-D, dicamba etc.). It is important to note concerning Imprelis damage:

- Experience with Imprelis is short, so information is limited.
- Injury has not resulted from all applications of Imprelis.
- Many reports seem to involve established Norway spruce or white pine, but there are some reports of possible damage to other species of trees and shrubs.
- Injury is often consistent with root uptake rather than drift.
- Symptoms do not always appear to be uniform throughout the canopy and begin as curling, yellowing, and browning of current season's growth leading browning of the entire tree in some severe cases.
- To prevent additional injury, grass clippings from treated lawns and chips from damaged trees should not be used as mulch or compost.
- DuPont has developed a website with additional information and hotline to report damage, <http://www.imprelis-facts.com/>

For more information on Imprelis and photos of symptoms see:

<http://extension.missouri.edu/p/AGW1016>

http://www.ohiolawncare.org/resource/dynamic/blogs/20110701_100054_27281.pdf

http://news.msue.msu.edu/uploads/files/122/Imprelis%20homeowner%20factsheet_Bert%20Cregg.pdf

Several reports and samples from Colorado blue spruce have involved *Rhizosphaera* needle cast and spruce needle drop (SNEED).

Rhizosphaera normally causes needle loss on the lower branches and the interior of the tree, with some branches retaining only the current season's needles. Affected needles may have fungal fruiting bodies emerging from stomates, visible with a hand lens. SNEED needle loss may occur on random branches throughout the canopy. Fungal fruiting bodies associated with SNEED occur on branches and twigs, not needles. For more information on *Rhizosphaera* needle cast see:

<http://ohioline.osu.edu/hyg-fact/3000/3059.html>

For information on SNEED see:

<http://na.fs.fed.us/fhp/fhw/csfhw/nov03/sneeddetaill.pdf>

<http://hyg.ipm.illinois.edu/article.php?id=282>



Small black fruiting structures of *Rhizosphaera* needlecast on spruce needles



Small black fruiting structures associated with SNEED on spruce branches



Bacterial leaf scorch symptoms
on pin oak leaves

Leaf Scorch

With the recent heat and dry conditions across much of the state, we are receiving reports of environmental leaf scorch symptoms, especially from southwest Missouri. Environmental leaf scorch may be apparent on younger trees without extensive root systems, or on a number of mature trees at the site. This type of scorch may weaken trees, but is not usually fatal and trees will frequently develop a normal, healthy canopy the following spring.

<http://extension.missouri.edu/explore/agguides/hort/g06881.htm>

Bacterial leaf scorch (BLS) symptoms may also be enhanced by hot dry conditions. In the past couple years, BLS has been confirmed on several trees, primarily oaks, in the St Louis metro area and

central Missouri. We have also had positives from Greene and McDonald counties. A review of the symptoms may be beneficial when trying to diagnose leaf scorch symptoms in the field. Trees with BLS symptoms may be more random in the landscape than those with environmental leaf scorch. On some species, there is a yellow halo between the BLS-scorched leaf margin and the healthy green interior of the leaf. See the following sites:

<http://www.na.fs.fed.us/fhp/bls/index.shtm>

http://www.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/PPFS-OR-W-12.pdf

Oak Wilt

Some of our recent branch samples submitted for oak wilt testing have been hot to the touch when they arrived due to the temperatures they were exposed to during mailing. Culturing required for identification of the oak wilt fungus becomes difficult following extended periods of summer heat even when the sample is kept cool in route to the lab. For confirmation of oak wilt, try to keep those samples cool and mail them overnight. If the tree (red oak group) rapidly developed oak wilt symptoms in late spring/early summer and is now approaching death, oak wilt is a good possibility. If symptoms have been slower to develop, there's evidence of slower decline and many dead brown leaves remain attached to the branches, other causes of death are more likely.

http://www.na.fs.fed.us/spfo/pubs/howtos/ht_oakwilt/toc.htm

http://www.na.fs.fed.us/spfo/pubs/howtos/ht_oaklab/toc.htm

Bacterial Wetwood and Slime Flux

We have had recent calls about oozing liquid, strong odors and insects associated with cracks or wounds in trunks and large branches of oak and mulberry. There is no cure, other than to wash away the material when



Signs of bacterial wetwood at
the base of a pin oak

it becomes offensive. Serious long-term impacts on tree health can often be prevented with good tree care practices to reduce tree stress.

<https://utextension.tennessee.edu/publications/Documents/SP631.pdf>

Diseases to Watch for in August

- **Cytospora canker** causes dieback to become visible on spruces
- **Iron chlorosis** is apparent on pin oaks
- **Bacterial wetwood** is evident with ooze from trunk or large branches on oaks, elm, mulberry etc.
- **Powdery mildew** evident on many species
- **Watch black walnut trees** for branch flagging that could suggest thousand cankers disease
- **Walnut anthracnose** will cause a random leaflet yellowing and premature leaf drop now
- **Bacterial leaf scorch** on certain hardwoods, especially oaks
- **Leaf scorch** due to heat and drought stress
- **Leaf yellowing and drop** due to drought stress, especially river birch, tuliptree, sycamore